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Pselaphid Beetles of an Illinois Prairie: The Fauna, and its Relation to the Prairie Peninsula Hypothesis

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Howard K. Gloyd, Director of the Museum

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INTRODUCTION

The great majority of species of the family Pselaphidae inhabit forests (Raffray, 1908; Park, 1942). Furthermore, the forest community is consider- ed as the ancestral or historical habitat of the family (Park, 1947a). Nevertheless, other niches are occupied by these beetles. Some ten to fifteen per cent of the species are either partially or wholly dependent upon social insects for food and shelter. The majority of these inquilines are members of ant societies; a relative few live with termites. Still other pselaphids inhabit grasslands, deserts, and a variety of intermediate situations.

Grassland pselaphids, as such, have been studied very little; no habitat has been examined quantitatively for these beetles primarily. The present study is concerned with the faunal aspects of the pselaphid beetle population of Peacock Prairie.

Peacock Prairie is a tract of approximately ten acres, located in Cook County, Illinois, some eight miles west of Evanston, on Milwaukee Road (Pl. I, Fig. 1). Its floristics have been reported by Paintin (1929). Miss Paintin did not find the evidence conclusive as to whether or not this area was virgin prairie in the strict sense. The evidence available to her, both from interviews of old residents and an analysis of the plants present, strongly suggested that the tract was native grassland, the soil of which had not been broken by plow.

The prairie lies just west of the Glenwood Beach of Glacial Lake Chicago, and is probably of swamp origin following the Wisconsin glaciation. It is part of the Peacock estate which was Indian territory prior to a government land grant in 1842. Miss Paintin learned from James Long, whose grandfather was the original owner, that Peacock Prairie had never, to his knowledge, been systematically grazed by cattle and had not been plowed.

The flora would seem to support this view. Characteristic prairie plants present on Peacock Prairie include *Silphium integrifolium, Silphium laciniatum,* four species of *Solidago,* and six species of *Aster.* On the other hand, the presence of certain introduced weeds suggests that this is not virgin prairie, and we are informed that the tract has been burned over on more than one occasion.[1]

The beetles were obtained from this area by two methods. First, starting with November, 1947, relatively regular weekly samples of prairie sod and its associated soil were brought back and subjected to a Berlese analysis. Each sample covered 0.08 square meter of sod, and weighed on an average of 5000 grams. Second, boards were laid down at random on the prairie floor, following the general technique of Cole (1946), and these served to " trap" pselaphids on the relatively moist, cool, and dark lower surfaces. These latter collections were started in April, 1948. Both collection methods, and soil temperatures, were continued through December, 1948. The Berlese analyses and soil temperatures are to be continued into June, 1949. These quantitative data, including populations and seasonal influences, are in the process of analysis for a future report.

THE PSELAPHID FAUNA OF PEACOCK PRAIRIE

In the first place, the paucity of specific references to grassland pselaphids should be emphasized. Very few general studies of the grassland community mention these beetles in their faunal lists. For example, the neglected

1 Personal communication from Dr. Max E. Britton.

Fig. 1. Peacock Prairie, a relatively undisturbed fragment of original prairie near Evanston, Illinois. Note two species of compass plants, and meter stick in foreground.

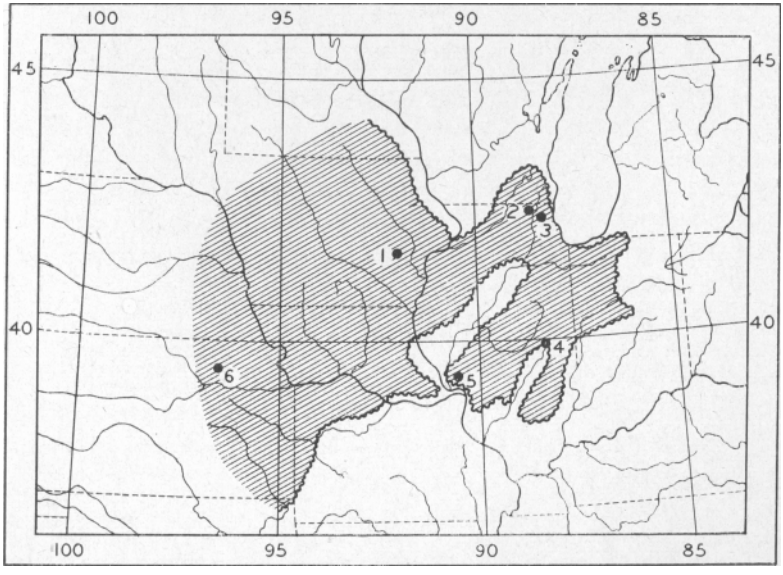

Fig. 2. Known distribution of the pselaphid beetle, Reichenbachia subsimilis Casey, as an example of a postglacial steppe relict in the Prairie Peninsula. Localities are (1) Iowa City, Iowa; (2) Algonquin, Illinois; (3) Peacock Prairie, near Evanston, Illinois; (4) Monticello, Illinois; (5) Grafton, Illinois; (6) Onaga, Kansas. Roughly indicated outline of Prairie Peninsula after Transeau, 1935. Scale: 1 inch equals 250 miles.

paper of Cameron (1917) on the Holmes Chapel district of Cheshire, England, the analysis of prairie in central Illinois by Shackleford (1929), and the comprehensive study of Nearctic grassland by Carpenter (1940) do not list pselaphids. This is surprising in view of their abundance in the sod of Peacock Prairie. Probably pselaphids did occur in these three areas cited, and either the collecting methods employed did not obtain them, or if specimens were obtained they were not discriminated. Certainly these beetles play a role in the prairie community that more or less parallels that played by pselaphids in the forest community, namely the nocturnal feeding upon mites and other small arthropods of the floor stratum (Park, 1947 a, b).

On the positive side, Morris (1922) collected a specimen of ***Brachygluta fossulata*** (Reichenbach) in the top inch of soil of a manured meadow in March at Rothamsted Experimental Station, Harpenden, Hertfordshire, England. This species is not restricted to grassland apparently since Denny (1825) collected it on several occasions from moss on tree stumps, and it is known from " sandy places" near Bexley.

Thompson (1924) reported ***Euplectus kunzei*** Aube from Aberystwyth, Wales.[2] In this detailed report one specimen was taken in July from the surface three inches of sod of a pasture that had been grazed as well as used for growing hay. A second specimen was taken in February from between three and nine inches deep in the sod, from cultivated land that had been fertilized heavily and used three years previously for the growing of potatoes. Attention is called here to the finding of this species deeper in the ground in February than in July, since this datum suggests that the population may have a vertical seasonal migration.

Three adults of ***Decarthron longulum*** LeConte were reported from the careful study by Wolcott (1937) on pastures and meadows in northern New York. Isolated records are equally infrequent. Blatchley (1910) records ***Rhexius insculptus*** LeConte collected by sweeping blue-grass in Indiana, and Park (1947 b) records ***Batrisodes striatus*** (LeConte) collected by sifting dried grass along margins of meadows in New York.

Five species of Pselaphidae were collected from Peacock Prairie. To simplify identification of this fauna, the following key is provided. In reality

2Euplectus kunzei Aubé is a synonym of *Euplectus brunneus* Grimmer according to Raffray (1908, 1910), Champion (1909) and Reitter (1909). The species of the genus *Euplectus* are thought to be inhabitants of forest floor litter, and especially of decaying logs and treeholes. For example, Reitter (1909) gives the habitat of *brunneus as* damp beech leaves on the forest floor, and in the United States the numerous species are usually taken in a variety of forest niches. The finding of *brunneus in* grassland sod parallels similar situations

this key is a key to genera, since but one species in each of five genera was taken. On the other hand, it is felt that the intensive methods used regularly over such a small and uniform area have discovered all of the normal residents.[3] Even so, five species of pselaphids from one prairie is a respectable showing. In a forthcoming conspectus of the pselaphid fauna of the Chicago Area (Park, 1949) some 43 species are listed. Thus the prairie species represent about 12 per cent of the local fauna —a fauna that is preponderantly associated with the forest habitat.

KEY TO THE PSELAPHIDAE OF PEACOCK PRAIRIE

Antennae geniculate, with the first segment very long, at least half as long as the funicle ***Rhexius insculptus*** LeConte.

Antennae not geniculate and the first segment much shorter than described above 2

2 (1) Pronotum with a fine, longitudinal carina that bisects the basal third, from basal margin nearly to disc; minute species, distinctly less than one millimeter long ***Bibloplectus integer*** (LeConte).

Pronotum with base not longitudinally bisected by a carina; larger species, distinctly more than one millimeter long

3 (2) Distal segment of maxillary palpi very long and conspicuous, with a slender, pedunculate base and the distal two-thirds swollen and lengthily setose ***Pselaphus fustfer*** Casey.

Distal segment of maxillary palpi not as described 4

4 (3) General body pubescence in the form of scales ***Pilopius lacustris*** Casey.

General body pubescence in the form of short, normally pointed setae (Plate II) ***Reichenbachia subsimilis*** Casey.

Before turning to more general aspects of this study a few words of annotation for each of these five species are desirable.

Bibloplectus integer (LeConte). This is the smallest and most abundant species in the prairie fauna under discussion, measuring about eight-tenths of a millimeter in length. It has a closely related southern ally, ***Bibloplectus ruficeps*** (LeConte) of the Gulf States. Formerly ***integer*** was generally considered as a synonym of ***ruficeps***. Bowman (1934) quite properly noted that this course was inadvisable until more evidence was at hand. Most of the records for ***ruficeps*** in the northern parts of the United States probably refer to ***integer***.

3 An exception may be the discovery of myrmecophilous pselaphids in nests of ants on the floor of Peacock Prairie. So far, Berlese samples of such nests have not yielded any pselaphid beetles.

These two species are not easily separated. They differ primarily in size and in the punctulation of the pronotal disk. Both of these characters tend to vary in a given population but in general *ruficeps* has the pronotal disk wholly or almost devoid of punctures and is seldom more than seven-tenths of a millimeter in length, whereas *integer* has the pronotal disk distinctly punctulate and is generally eight-tenths of a millimeter or slightly more in length.

It may be that *integer* and *ruficeps* will prove to intergrade in a long series from the Gulf of Mexico to Michigan and Wisconsin, in which case *integer* may be considered as a subspecies of ruficeps. This is not the place to present the evidence, where local issues are uppermost.

It would seem that *integer can* not be considered a prairie species in the strict sense. It is very abundant in Peacock Prairie, and has been taken from grass sod at Grafton, Illinois. On the other hand, it inhabits the tree holes in the upland oak-hickory forests of Palos Park, Illinois and occurs in leaf mold samples from forests of northern and central Illinois and Indiana.

Rhexius insculptus LeConte. This species is distinctive in the Chicago Area by reason of its elbowed or geniculate antennae. The case for *insculptus* is hardly more reassuring than that of *integer.* It will be remembered that Blatchley recorded *insculptus* from blue-grass in Indiana, and this species occurs sparingly in Peacock Prairie. On the other hand it occurs in forest floor leaf and log mold near New Lennox, Illinois. Outside of the local area the same situation appears to exist, since *insculptus* had been taken from grassland at Onaga, Kansas and from forests in the Steinhatchee River basin of Florida.

Pselaphus fustifer Casey. This species is the least abundant of the Peacock Prairie fauna. There is insufficient ecological data to discuss its habitat distribution.

Pilopius lacustris Casey. This appears to be the common species of its genus in the Great Lakes area but" its discrimination from its allies, especially *piceus* (LeConte), and *zimmermanni* (LeConte) requires exact knowledge of sex, preferably by dissection.

Casey's *lacustris* is abundant at Peacock Prairie, and has been taken beneath stones in meadows near Chicago, and near Algonquin in McHenry County.

A point worth noting is that the tribe to which *Pilopius* belongs, the Ctenistini, includes a number of species that are typical of regions of great aridity; e. g., arid areas of the western United States, where vegetable mold is sparse. For example, of the nineteen Nearctic ctenistines, eight inhabit arid areas of Texas and Arizona, one is a western species, living with ants,

be that *lacustris* is adjusted naturally to the relatively greater exposure of prairie conditions.

Reichenbachia subsimilis Casey. We are inclined to consider this species as more typical of the prairie habitat than any of the preceding species. The genus is the largest of the family, with more than 300 species. It is cosmopolitan with the exception of Australia and New Zealand, and preponderantly tropical in distribution. The great majority of the species are recorded from forests, but some are known from grassland and others have been taken in ant nests.

R. subsimilis is the second most abundant pselaphid from Peacock Prairie. It was described from Iowa, and is known from Onaga, Kansas and several prairie localities in Illinois. We have no forest records for this species. Because of its importance in the present study, this species has been illustrated (Plate II), and forms the central theme of the following section.

RELATION TO THE PRAIRIE PENINSULA HYPOTHESIS

Despite the general differences between forest and grassland, their respective pselaphid inhabitants probably perform the same roles in both. That is, they are concerned indirectly with the formation of organic soils. These minute predators, and their allies, feed in part upon collembolans, mites and other herbivores of the floor stratum. In this way they tend to regulate indirectly the amount of floor mold readily available for bacterial action (Allee, Emerson, Park, Park and Schmidt; Park, 1947a).

Two of the five species collected at Peacock Prairie are also known from local forests. These two are *Bibloplectus integer* and *Rhexius insculptus.* By inference, these latter would seem to be adjusted to both prairie and forest floors. Of course, all five species may occur normally in both habitats. Such a view is not attractive when the differences between woodland and grassland are remembered. Such differences include the great differential in both the quality and quantity of humus, of floor debris, the quality and intensity of incident light, gradients in soil moisture, soil and air temperatures, rate of evaporation, relative humidity and wind velocity.

A third species, *Reichenbachia subsimilis,* is known only from prairie localities. The type locality is Iowa City, Iowa. As noted previously, it is known from Onaga, Kansas, and in addition to Peacock Prairie, we have this species from meadow or modified prairie from Algonquin, Grafton, and Monticello, Illinois. This suggests that the species is one in which the popu-

When these six known localities are mapped (Pl. I, Fig. 2), the further suggestion emerges that *Reichenbachia subsimilis* is a relict from a postglacial steppe fauna. This postglacial steppe or prairie peninsula included the Chicago Area (Gleason, 1922; Transeau, 1935; Schmidt, 1938). It is probable that after glaciation the local region became a prairie extension that was subsequently invaded by the northward advance of hardwood forests. These forests re-established a relatively continuous deciduous forest habitat in the area. Under such altered conditions the steppe peninsula pselaphids could either become exterminated, or adjust to the forested conditions, or emigrate westward into the grassland, or persist locally as relicts. On the basis of the known data, *Reichenbachia subsimilis* appears to be established in the western grassland, and to have remained in scattered meadows and prairie remnants in Illinois. Future collecting may alter, or justify, this hypothesis but in view of the general paucity of pselaphid records, the congruence between the supposed outlines of the prairie peninsula and the zoogeographic information available on this species seems convincing. Especially notable is the lack of records of this species from woodland in the Chicago Area, where the pselaphid fauna has been studied as much as feasible over the past two decades.

TABLE I

Pselaphidae Reported from Grassland and Meadows

Species	Locality	Source
1. *Rhexius insculptus* LeConte	Indiana	Blatchley, 1910
	Onaga, Kansas	Present Report
	Peacock Prairie, Illinois	"
2. *Euplectus brunneus* Grimmer	Aberystwyth, Wales	Thompson, 1924
3. *Bibloplectus integer* (LeConte)	Peacock Prairie, Illinois	Present Report
4. *Melba sulcatula* Casey	Monticello, Illinois	Present Report
5. *Reichenbachia subsimilis* Casey	Iowa City, Iowa	Casey, 1897
	Onaga, Kansas	Present Report
	Algonquin, Illinois	" "
	Peacock Prairie, Illinois	"
	Monticello, Illinois	" "
	Grafton, Illinois,	"
6. *Brachygluta fossulata* (Reich.)	Harpenden, Herts.	Morris, 1922
7. *Decarthron longulum* (LeConte)	New York	Wolcott, 1937
8. *Batrisodes striatus* (LeConte)	New York	Park, 1947b
9. *Pselaphus fustifer* Casey	Peacock Prairie, Illinois	Present Report
10. *Pilopius lacustris* Casey	Peacock Prairie, Illinois	Present Report

A respectable number of species of pselaphids have been reported from various types of Nearctic grassland or its cultivated equivalents. Those known to the authors are gathered together in tabular form (Table I). Some of these may prove to be chance records of typical woodland forms; others appear to be adjusted to both forest and grassland; still others may be as typical of prairie habitats as *Reichenbachia subsimilis* appears to be. Finally, future work will add to this list in all probability.

As a postscript, it should be emphasized that because of their small size, nocturnal habits, and indifferently known requirements, pselaphid beetles are not as suitable as indicators of forest or prairie conditions as are many plants and larger animals.

SUMMARY

A survey was conducted between November, 1947 and December, 1948 to obtain information on the pselaphid beetle population inhabiting the upper three inches of sod at Peacock Prairie, near Evanston, Illinois.

Five species of Pselaphidae were collected. These are *Bibloplectus integer* (LeConte), *Rhexius insculptus* LeConte, *Reichenbachia subsimilis* Casey, *Pselaphus fustifer* Casey, and *Pilopius lacustris* Casey.

Relatively regular weekly collections were made. These consisted of sod samples of 0.08 square meter, averaging 5000 grams wet weight, and by manual collecting from beneath boards placed at random over the prairie. The sod samples were Berlesed.

The species taken are discussed briefly in general terms, a key is provided for their identification, their distribution in the Chicago Area and their probable role in the grassland community are outlined.

Reichenbachia subsimilis is discussed as an example of a postglacial steppe relict in the Prairie Peninsula, and a table of Nearctic grassland pselaphids is given.

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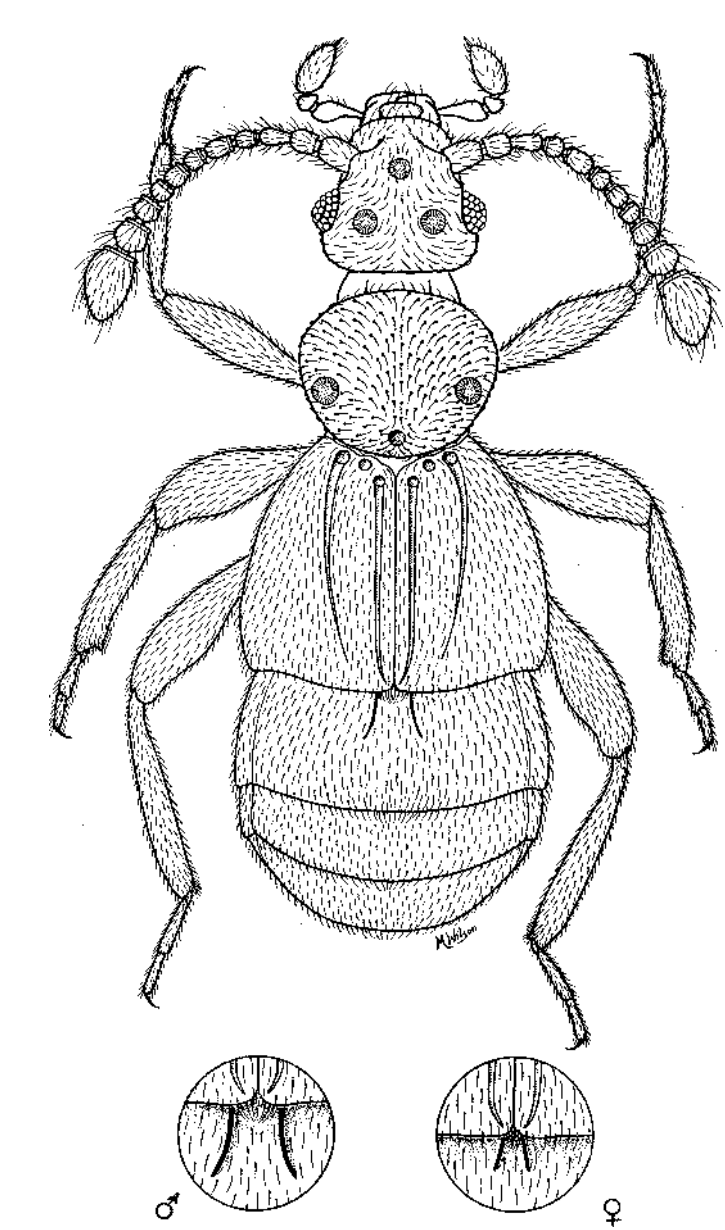

Dorsal aspect of a male *Reichenbachia subsimilis* Casey, a typical prairie pselaphid beetle. Length of beetle 1.2 millimeters. Circular insets show differences in basal abdominal carinae as between the sexes.